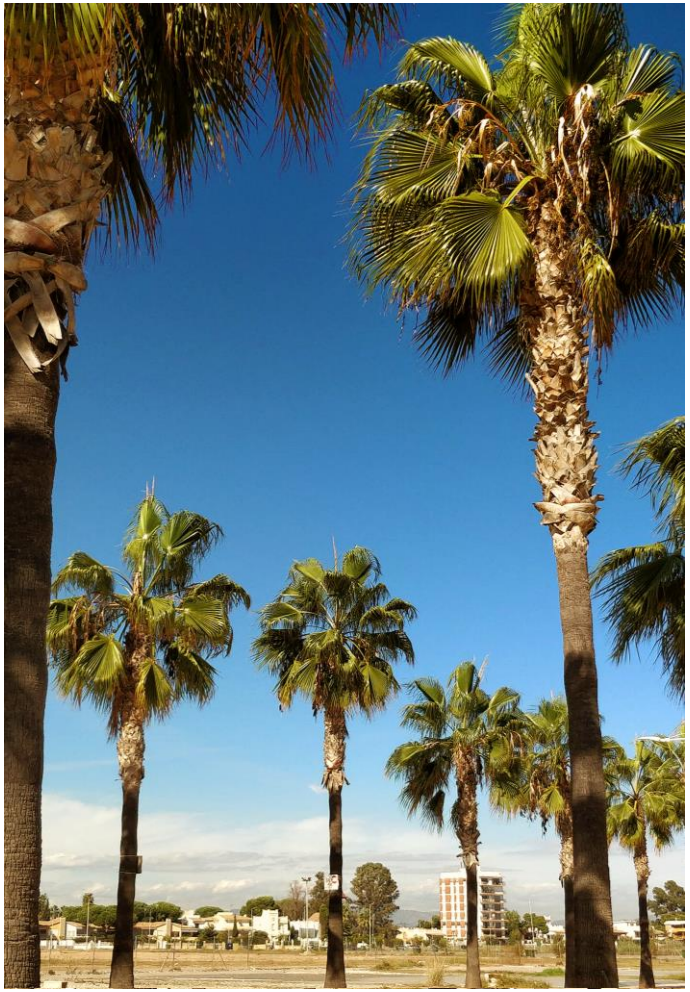


Reducing Water Loss with Artificial Intelligence in Borriana Spain

FACSA is pioneering the implementation of virtual DMA technology in the Mediterranean Area

facsa
ciclo integral del agua

BuntPlanet
DreamingMinds

1/ The situation

Borriana is a coastal municipality in Castellón de la Plana. It has around 35,000 inhabitants, although in summer the population reaches 40,000. Much of the current water pipe infrastructure was installed in the 1940s, at which time the existing distribution network was completely renewed and expanded to all urbanized areas. This infrastructure has been progressively updated since then and a complete renewal of the network began in 2004, which has significantly improved the service provided to customers.

Since 2015, water distribution and sanitation in Borriana have been managed by FACSA. FACSA is a private water utility founded in 1873 to provide Castellón with a modern distribution network for drinking water. The company provides water to more than 1 million people in 70 municipalities in Spain.

Before the implementation of BuntBrain, the network was divided into 12 DMAs, ranging in size from 7 km to 66 km pipe length. If there was a leak in one of the DMAs, the utility had no alternative but to search within an area corresponding to the entire DMA where the leak was reported. Leaks were detected by humans, performing daily reviews of the night flow values of each flow meter.

2/ The challenge

The challenge for BuntPlanet was to test the virtual DMA concept, of which the most significant advantages are:

- To detect small leak in DMAs of any size.
- The ability to reduce the search area in the case of a leak.
- To improve network resiliency.
- To improve water quality.

To roll out the advanced version of BuntBrain LeakFinder, a large DMA (HvDMA) was built up by opening three of the twelve DMAs (H6, H7 and H8).

DMA	KM	Flow meters
H6	12.22	1 inflow, 2 outflow
H7	10	1 inflow
H8	13.65	1 inflow
HvDMA	35.87	1 inflow, 4 internal

FACSA decided to increase the number of flow meters in the new larger DMA by two units and wanted to determine the best positions to install the new flow meters.

A hydraulic model was already available, but it required calibration in a dynamic way to achieve high levels of accuracy to pre-locate leaks.

3/ The solution

The BuntBrain LeakFinder Advanced version was implemented to monitor the large new DMA (HvDMA). The Standard version of BuntBrain LeakFinder was implemented to monitor the other seven DMAs (A, B, C, D, E, F, G, H and I).

Valves were opened in order to create the new large DMA (HvDMA). A dynamic calibration of the hydraulic model at HvDMA was performed. This process of dynamic calibration serves to correctly characterize the physical aspects of the network and identify errors in the model such as missing pipes, closed valves, etc.

Once the hydraulic model was dynamically calibrated, a decision on the location of the two new flow meters to be installed was made by a sensitivity analysis of the hydraulic model. This analysis takes into account various different factors such as clusters of potential leak areas and minimum detectable leak size.

Two new ultrasonic flow meters were installed in the recommended positions.

In order to test the virtual DMA approach, two artificial leaks of around 0.5 l / s were generated at two different points in the HvDMA during night by the opening up of hydrants. The tests took place on 13rd and 14th June (2019).

The first artificial leak, was pre-located in a virtual DMA with a radius of 200 m. The second leak was pre-located in a virtual DMA with a radius of 500m.

The test was successful: The detection of both artificial leaks was achieved using search areas which were much smaller in size than the size of any of the physical DMAs previously used in the FACSA network (from a 10 km pipe length area to a 300-500 m radius).

4/ The benefits

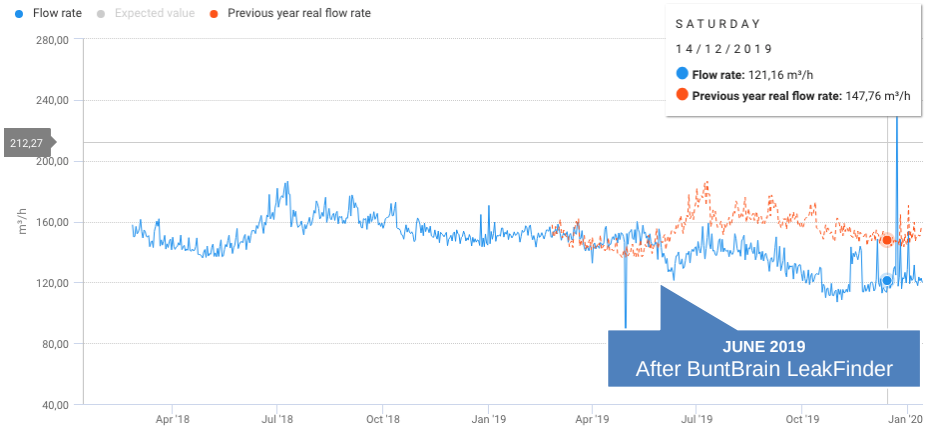
The virtual DMA concept was successfully tested for the first time in the Mediterranean area.

Now FACSA can extend the concept to other DMAs in those areas of the network where they want to:

- Detect small leaks in large DMAs.
- Reduce the size of the search area for finding leaks.
- Improve water quality.
- Increase network resiliency.

Since the installation of BuntBrain LeakFinder, more than 400 abnormal situations have been detected and solved, more than 70 of which corresponded to leaks.

A reduction in average night flow (average night consumption) of 20% has been achieved compared to the previous year's data. Since total consumption is the sum of actual consumption and water losses, and because actual consumption doesn't change, a 20% reduction in total consumption is equivalent to a reduction in water losses, due to leakage, of approximately 30%.



5/ Project brief

- Municipality: Borriana (Castellón, Spain).
- Population served: 35.000.
- Number of customers: 19.000.
- Network length: 185 km (mains).
- Implementation completed: June 2019.

6/ Solutions

- BuntBrain LeakFinder (advanced version) in the Cloud implemented in HvDMA.
- BuntBrain LeakFinder (standard version) in the Cloud implemented in DMAs (A, B, C, D, E, F, G, H and I).
- Hydraulic model dynamically calibrated.
- Sensitivity analysis performed to determine best positions to install two additional ultrasonic flow meters.
- Two additional ultrasonic flow meters installed.

7/ Results at a glance

- Virtual DMA concept successfully tested in the Mediterranean Area for the first time.
- 74 leaks detected and repaired.
- Pre-location algorithms based on AI and hydraulic simulation, reduced the time to identify the specific pipe leaking (from a 10 km pipe length area to a 300-500 m radius).
- Approximately 30% leak reduction has been achieved comparing average night consumption to previous year.

8/ End customer

FACSA

9/ Distributor

BuntPlanet

10/ Links

www.buntbrain.com